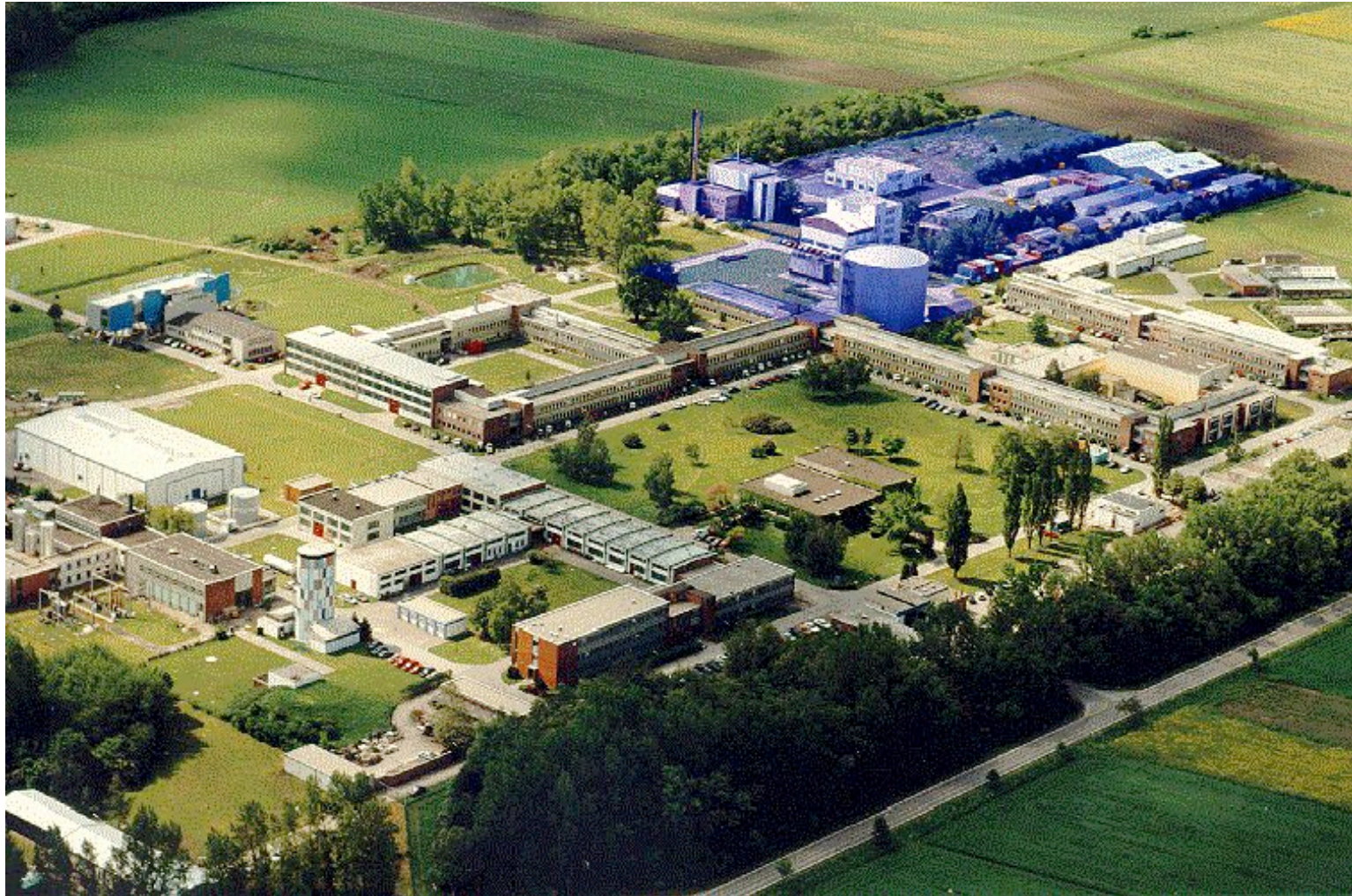


# Projected Worker and Public Doses from Long-term Intermediate Storage of Radioactive Waste at Nuclear Engineering Seibersdorf

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# Nuclear Engineering Seibersdorf, a Company of the ARC



## Sole Contractor to the Republic of Austria



lebensministerium.at

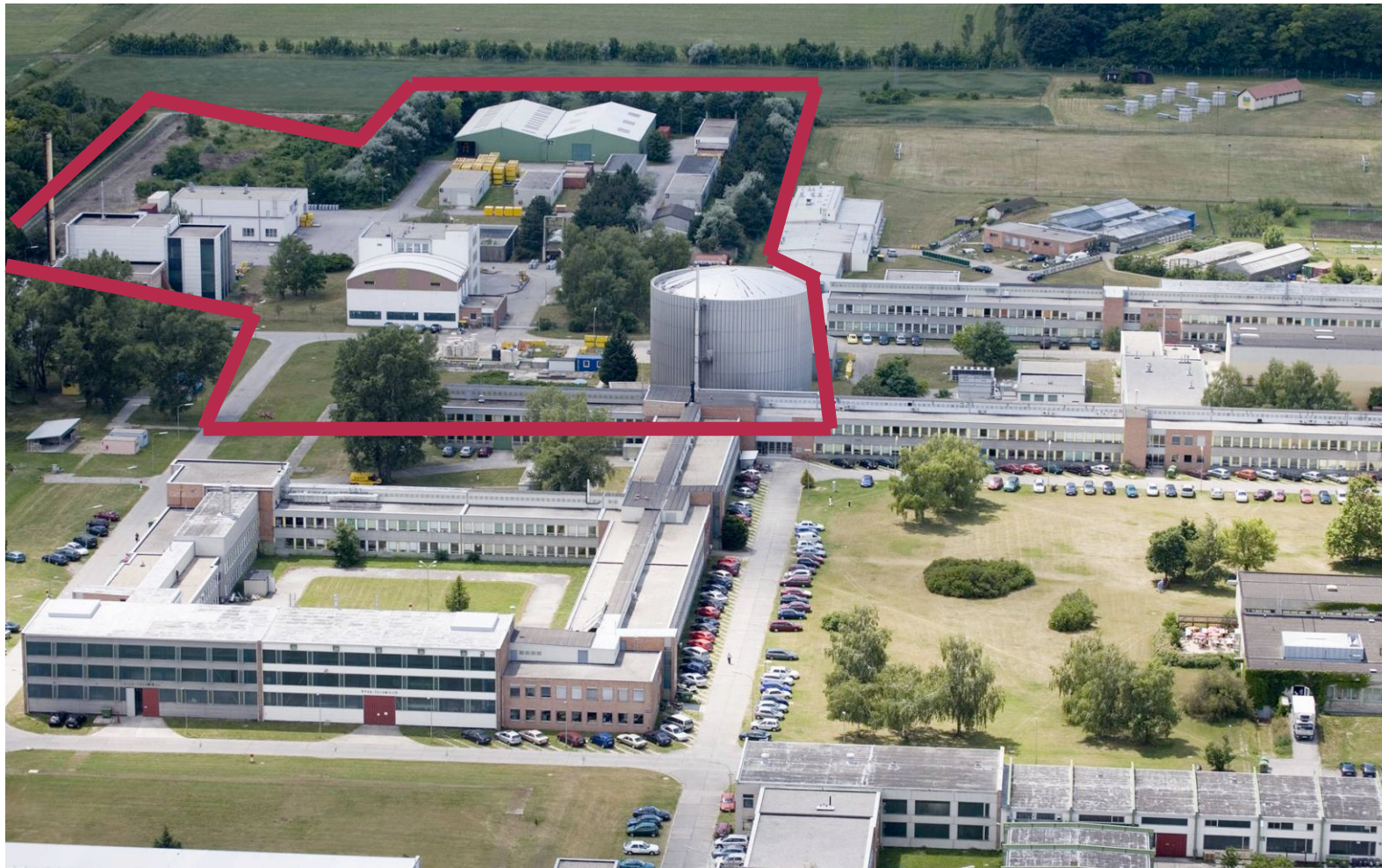
- Treatment and conditioning of all radiological waste generated in Austria
- Interim and transfer storage including construction of a transfer storage facility
- Re-conditioning historical waste
- Preparation of the waste for storage in a final repository



- Decommissioning of the ASTRA-Reactor 2000 bis 2006
- Decommissioning of facilities, components, and laboratories used in 45 years of R&D
- Decommissioning Hot Cells
- Treatment, conditioning, and intermediate storage of radiological wastes generated



# Treatment and Intermediate Storage of Radiological Waste





## Current Facilities

- Work shop
- Hot Cells
- Pre-treatment storage
- Intermediate storage
- Release measurements



## Current Technologies

- Incinerator
- Water treatment
- Compactor
- Dryer
- Cementation (no longer used)





## From Short- to Long-term Intermediate Storage

- Intermediate storage of LILW according to the contract between the Republic of Austria, the Seibersdorf municipality, and NES
- Renewal and extension of the contract including realistic storage requirements (until 2030).
- As of June 2007: 10.000 drums in intermediate storage
- Investment into renovation, upgrade, and extension of the intermediate storage facility for long-term intermediate and transfer storage starting 2007, final capacity up to 20.000 drums
- Re-conditioning of approximately 2500 drums of historical waste expected to start 2008



## Conditions on Long-term Storage

- **Long-term stability of waste packages**
  - First onset of corrosion in historical waste
  - Chemical and electro-chemical processes in waste package (steel drum)
  - Excess water in package and condensation in facility
  - Remediation by: heating and moisture removal systems, removal of excess water in steel drums by drying
- **Accessibility of all waste packages**
  - Currently, closest packing of drums for intermediate storage
  - Individual accessibility requires extension of storage space
  - Two new facilities under construction
- **Necessary for public acceptance**



## ALARA Considerations

- **Public and worker doses**
  - Currently, doses are generally very low
  - Results from extensive monitoring programs over the past 30 years
  - Show no significant impact of the site on public doses
  - Dose rate and release limits ( $< 1$  mSv/y and  $< 0.3$  mSv/y, respectively), operation well within limits
  - Worker doses: external: do not exceed 1-1.5 mSv/y, internal: no conclusive evidence that  $> 1$  mSv
- **Future worker exposure**
  - Expected to increase due to additional handling of waste packages
  - Design of new technological tools (remote handling, etc.)
  - Bottom line: optimized rather than minimized exposure as a result

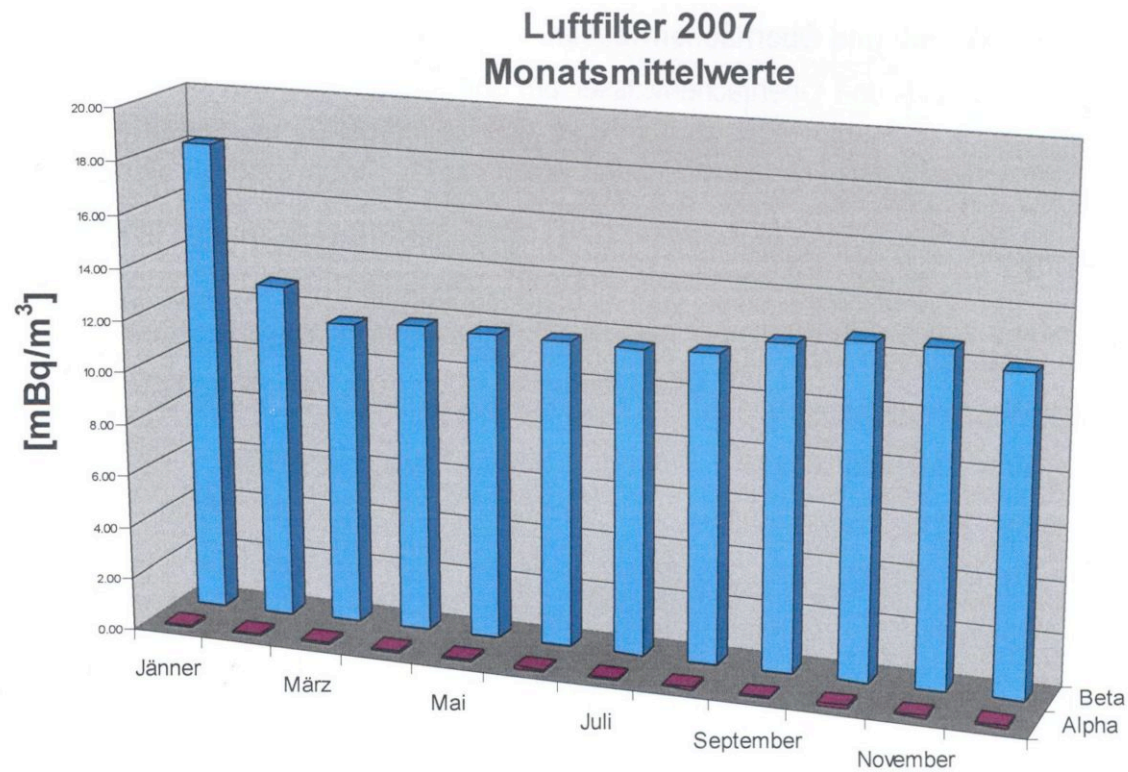
# Monitoring Program (Environmental)

- External dose rate at site boundaries and surrounding townships
  - Results 2007
  - No significant change in the past years

Messort INNENRING		Messperiode 2007								Jahr 2007	
		Dez. - Feb.		März - Mai		Juni - Aug.		Sept. - Nov.		Mittelwert Dosisleistung [nSv/h]	Summe Dosis [mSv]
		Messbeginn: Messende:	24.11.06 05.03.07	Messbeginn: Messende:	20.02.07 04.06.07	Messbeginn: Messende:	24.05.07 05.09.07	Messbeginn: Messende:	22.08.07 04.12.07		
Bezeichnung	Nummer	DOSISL. [nSv/h]	DOSIS [µSv]	DOSISL. [nSv/h]	DOSIS [µSv]	DOSISL. [nSv/h]	DOSIS [µSv]	DOSISL. [nSv/h]	DOSIS [µSv]		
KANTINE	1	77	186	68	169	67	168	69	173	70	0,70
DEL	2	82	199	79	198	76	190	82	204	80	0,79
KRAFTH.	3	89	215	80	199	81	202	82	204	83	0,82
IAEA	4	77	186	74	184	81	201	75	187	77	0,76
SAL	5	75	183	75	187	71	177	79	198	75	0,74
REAKTOR	6	81	197	85	213	82	206	85	212	83	0,83
AUFBEREITUNG	7	72	175	67	168	69	171	70	175	70	0,69
LAGERHALLEN	8	86	208	86	214	83	208	84	210	85	0,84
BAUSTOFF PRJ.	9	94	228	93	232	92	228	85	212	91	0,90
WESTECKE	10	82	199	80	200	80	199	76	190	79	0,79
TENNISPLATZ	11	84	204	78	194	76	190	82	205	80	0,79
ST. SCHUTZ	12	82	198	74	185	72	180	74	186	76	0,75
										Mittelwert Z:	0,78
										Abweichung Z:	0,06
AUSSENRING											
REISENBERG	1	74	179	70	176	69	171	70	174	71	0,70
SEIBERSDORF	2	77	188	77	192	79	197	82	206	79	0,78
WALTERSDORF	3	74	178	78	195	78	194	75	188	76	0,76
HOF a/Lb.	5	77	187	75	187	75	187	78	195	76	0,76
										Mittelwert A:	0,75
										Abweichung A:	0,03

## Monitoring Program (Environmental) II

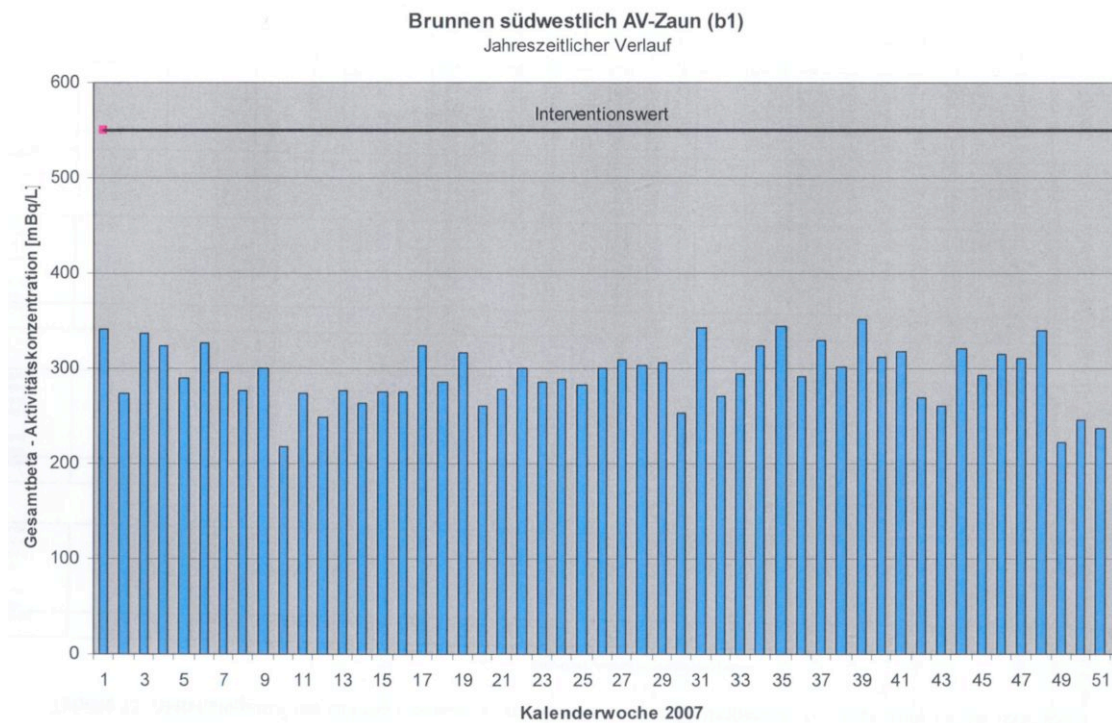
- **Aerosols at representative site location**
  - Results 2007
  - No significant change in the past years





## Monitoring Program (Environmental) III

- **Ground water in site wells**
  - Results 2007
  - No significant change in the past years



## Monitoring Program (Environmental) IV

- **Surface water, sediment, and fauna**
  - Results 2007
  - No significant change in the past years





# Monitoring Program (Environmental) V

- **Soil and plant samples on- and off-site**
  - Results 2007
  - No significant change in the past years

Tabelle 19: Aktivitätsgehalt der Bewuchs- und Bodenproben am Gelände und in der Umgebung des Standorts

Periode	Probenahmestelle	Gesamtalpha [Bq/m <sup>2</sup> ]	Gesamtbeta [Bq/m <sup>2</sup> ]	Bewuchsproben			Bodenproben		
				<sup>238/242</sup> Pu [Bq/m <sup>2</sup> ]	<sup>238</sup> Pu [Bq/m <sup>2</sup> ]	<sup>90</sup> Sr [Bq/m <sup>2</sup> ]	<sup>238/242</sup> Pu [Bq/m <sup>2</sup> ]	<sup>238</sup> Pu [Bq/m <sup>2</sup> ]	<sup>90</sup> Sr [Bq/m <sup>2</sup> ]
1. Quartal 2007	IAEA	13.5 ± 2.2	87.9 ± 4.9	< 0,012	< 0,005		3.6 ± 0.7	0.8 ± 0.3	
	ARCS-NA	30.0 ± 4.1	108.8 ± 6.1	< 0,029	< 0,031		1.2 ± 0.2	0.5 ± 0.2	
	ARCS-GS		kein Bewuchs vorhanden				4.1 ± 0.6	2.2 ± 0.4	
	Reisenberg	44.4 ± 6.9	162.4 ± 9.4	< 0,010	< 0,005		1.8 ± 0.4	0.5 ± 0.2	
	Seibersdorf	39.9 ± 5.0	✓ 72.3 ± 4.3	< 0,008	< 0,004		1.5 ± 0.4	< 0,5	
	Neumühle	19.1 ± 3.7	333.0 ± 17.5	< 0,010	< 0,010		2.9 ± 0.5	< 0,5	
2. Quartal 2007	IAEA	28.5 ± 6.0	372.8 ± 20.1	0.011 ± 0.004	0.007 ± 0.003		4.7 ± 1.0	1.6 ± 0.6	
	ARCS-NA	34.9 ± 5.4	364.0 ± 19.2	< 0,004	< 0,005		5.0 ± 1.0	< 1,1	
	ARCS-GS	✓ 3.6 ± 1.0	135.1 ± 7.0	< 0,006	< 0,004		3.2 ± 0.8	1.5 ± 0.5	
	Reisenberg	38.4 ± 7.4	✓ 560.9 ± 29.7	< 0,011	< 0,007		3.7 ± 0.9	< 1,9	
	Seibersdorf	23.2 ± 5.5	550.9 ± 29.0	< 0,005	< 0,006		3.3 ± 0.9	< 1,9	
	Neumühle	6.7 ± 2.9	522.2 ± 27.2	< 0,010	< 0,007		2.5 ± 0.6	< 0,8	
3. Quartal 2007	IAEA	11.5 ± 2.2	123.2 ± 6.7	< 0,004	< 0,006	3.17 ± 0.17	2.4 ± 0.5	< 0,8	✓ 3.21 ± 0.66
	ARCS-NA	19.0 ± 3.4	184.3 ± 10.0	< 0,005	< 0,005	14.83 ± 0.38	3.9 ± 0.6	< 0,7	✓ 15.27 ± 0.83
	ARCS-GS	4.1 ± 1.0	122.9 ± 6.5	< 0,005	< 0,004	1.88 ± 0.13	3.9 ± 0.7	1.8 ± 0.5	9.22 ± 0.84
	Reisenberg	14.5 ± 2.7	194.5 ± 10.4	< 0,004	< 0,007	2.61 ± 0.17	2.2 ± 0.7	< 1,8	4.71 ± 0.89
	Seibersdorf	7.3 ± 2.1	329.1 ± 17.2	< 0,006	< 0,005	2.82 ± 0.15	2.3 ± 0.5	< 0,8	3.34 ± 0.56
	Neumühle	✓ 54.3 ± 9.2	474.9 ± 25.7	0.013 ± 0.005	< 0,007	2.32 ± 0.25	4.6 ± 0.9	< 0,9	7.78 ± 1.57
4. Quartal 2007	IAEA	8.3 ± 1.5	110.7 ± 5.9	< 0,006	< 0,004		5.8 ± 1.4	< 1,6	
	ARCS-NA	31.7 ± 4.2	173.0 ± 9.3	< 0,006	< 0,006		9.7 ± 1.5	< 2,0	
	ARCS-GS	12.3 ± 1.9	110.8 ± 5.9	< 0,006	< 0,004		✓ 14.3 ± 2.1	6.3 ± 1.4	
	Reisenberg	17.4 ± 3.3	240.1 ± 12.7	< 0,005	< 0,008		3.5 ± 1.1	< 3,4	
	Seibersdorf	9.0 ± 1.6	148.2 ± 7.7	< 0,004	< 0,005		3.1 ± 0.8	1.8 ± 0.7	
	Neumühle	11.1 ± 2.2	151.4 ± 8.0	< 0,007	< 0,004		8.1 ± 1.4	< 1,1	



## Conclusions

- **From short- to long-term intermediate storage**
  - Necessities for acceptance by authorities and public
  - Long-term stability of waste package
  - Individual accessibility of waste packages
- **ALARA**
  - Current situation: doses already low
  - No significant impact of facility on public doses
  - Worker doses ranging from 1 to a few mSv/y
- **Future of Austrian radiological waste treatment and storage**
  - Renewal, upgrade, and extension of current facilities at NES
  - Additional handling of waste packages will increase worker exposure
  - Optimized, rather than minimized exposures will have to be achieved